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The Organization of an Operation.

BY

W. W. KEEN, M.D.,

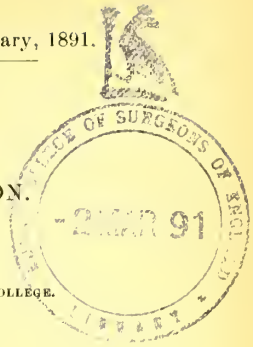
PROFESSOR OF THE PRINCIPLES OF SURGERY, JEFFERSON MEDICAL COLLEGE.

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THE ORGANIZATION OF AN OPERATION.

By W. W. Keen, M.D.,
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Our text-books on surgery, in treating on Operations, give directions as to the need of an ample number of assistants and the assignment and nature of the duties of each, of preparing the room, etc.; but so far as I know, they do not insist on the proper method of organizing the operation as to the minute written or printed directions to the nurse and to the physician in charge in any systematic way. For the want of this the family, the physician, and the nurse do not know what is expected of each, and often the needed preparations are not made until the surgeon arrives in person.

In my earlier professional life, before doing an operation I was compelled to sit down and make a list of what was wanted, and also to give verbal or written directions to the nurse, the family, and the physician. At each operation this laborious process had to be repeated, and the chances were that I would forget some one or more of the details of the preliminary preparation, or some minor instrument or necessary appliance that I wanted during the operation. Gradually the matter systematized itself in my mind, and some twelve or fifteen years ago I prepared a blank somewhat similar to the one presented below. I have been so often asked for a copy of this blank that I have finally decided to publish it in this article, and in addition Messrs. Lea Bros. & Co. have kindly consented to publish the blank in pads of fifty each, so that they may be available to any surgeon who desires to use them. Probably others have adopted some more or less similar plan but I know of none that has been published.

My custom is, before each operation, to take one of these blanks, run over its items and check those that are applicable to the case. I then send or hand it to the physician in attendance, with the request that everything shall be prepared in accordance with it. If it is a private case of my own I hand it to the nurse and expect her to attend to the items of the first two divisions, and I check and so order from the drug-store such appliances, dressings, or drugs of the third and fourth divisions as I require.

Operation Blank.

..... 18

For the operation on M (name and address) on (date) at o'clock, please see that such of the following preparations as are checked are all made beforehand.

.....M.D.

I. The Patient.

1. The day before the operation shave the parts; scrub well over a wide area with soap and water; then with ether; then with sublimate solution, 1:1000; then apply a sublimate gauze dressing and bandage to remain until the operation.

2. See that the bowels are opened by a gentle purge given the previous evening, and if need be by a morning enema.

3. Wash out the vagina and rectum.

4. For breakfast a cup of clear soup (no bread or other solid food), and no food later.

5. Have the patient in bed (in an adjoining room, if possible) a half-hour before the operation, with night-dress, chemise or undershirt, drawers, and stockings only.

II. The Room and Bed.

1. Take up the carpet, remove curtains, draperies, and all furniture except a bureau, washstand, table, and two cane-seat or wooden chairs; clean the room; clean the walls and ceiling with a brush or broom covered with a towel; then wash the floor, woodwork of walls, and furniture with carbolic solution, 1:40; have clean carpet strips ready to lay on the floor after the operation.

2. A firm four-legged table, with three old blankets and a pillow in front of a window (north light preferred).

3. Remove the window-curtains, and screen the lower sash by paper or towels.

4. Four toilet tables for instruments, dressings, etc.

5. Protect the floor.

6. Two blankets on the bed instead of sheets.

7. Protect the bed by rubber cloth and a draw sheet.

8. Ten hot-water bottles well corked.

9. Hoops to support the bed-clothes.

10. Waste water bucket.

11. Five china basins and one tin basin.

12. Three sheets and fifteen towels, to be wrung out of sublimate solution, 1:1000, the night before the operation and rough-dried.

13. Two dozen large safety-pins.

14. Tumbler, tablespoon, and teaspoon.

15. Nail-brush.
16. Two pitchers of cooled boiled water.
17. Plenty of hot water.
18. A sheet of stout wrapping-paper.
19. 1½ yards white flannel.
20. Fresh clear soup and milk.
21. Olive oil, two ounces.
22. A half-pint of vinegar.

III. Dressings, etc.

1. One can of Am Ende's sublimate gauze.
2. One roll of Hartmann's wood-wool dressing.
3. A piece of "rubber dam" x inches.
4. Four bandages, inches wide.
5. Two ounces borated cotton.
6. ¼ pound of "Globe antiseptic wool."
7. Bed-pan.
8. Catheter.
9. Thermometer.
10. Hypodermatic syringe.
11. A bent glass feeding-tube.

IV. Medicines, etc.

1. Carbolic acid (No. 1), fl℥ vss in a half-gallon bottle of distilled water.
2. Carbolic acid (No. 1), fl℥ vj.
3. Two ½ pound cans Squibb's ether.
4. Chloroform, fl℥ iv.
5. Liq. morph. sulph., fl℥ j.
6. Four suppositories, 1 grain opium each.
7. Spirits ammon. aromat., fl℥ ij.
8. Alcohol, Oj.
9. Ten-grain powders of sulfonal in no. 4.
10. Brandy, fl℥ iv.
11. Lime-water, fl℥ iv.
12. Sublimate tablets for 1:1000 solution, no. xx.

I would like to add a few words in explanation of some of these directions, lest they should be obscure or misunderstood.

Part I.

(4) For the meal before the operation I always prefer a cup of clear soup rather than milk, with no bread or other solid food. My reason for this is that the anxiety which is so common and so natural before an

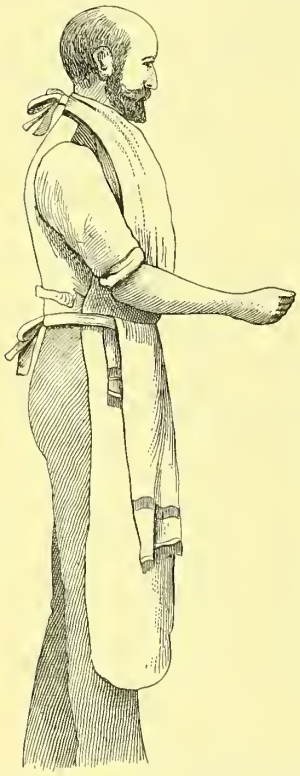
operation frequently disturbs the digestion to such an extent that even milk curdles in the stomach, is not digested, and is often vomited in large curds.

Part II.

(6) As after the operation the patient is apt to be in more or less of a condition of shock and to feel the cold, I always prefer that he shall lie between blankets instead of sheets.

(8) I always order ten hot-water bottles, well corked, three to be placed on each side of the patient, two or three between the legs, and one or two at the feet. After the patient is placed in bed and covered with the blanket these bottles are placed upon the upper blanket, and thus any danger of burning the skin is avoided.

Fig. 1.



The author's mode of using a sterilized sheet instead of an apron, the upper end being turned next the chest and over the bandage around the neck. The towel and bandages are also sterilized.

(11) Of the five china basins I use one for washing the hands and forearms before beginning the operation, a second for alcohol to cleanse the hands with, a third for a hot bichloride solution for disinfecting the hands after the alcohol, a fourth (after disinfection) for sponges or their substitute (see below), and the fifth for a hot bichloride solution in which to wash my hands repeatedly during the operation. The tin basin is used in case the patient vomits, and is chosen on account of its light weight.

(12) The three sheets are folded about six feet long and eighteen inches wide. About a foot of the upper end is turned under, the short end being next the chest, and hanging over a bandage which is tied around the neck. Another bandage around the waist secures the sheet to the body. I use these for myself and two assistants as substitutes for the ordinary aprons or operating-coats. My reasons for this are, first, because they are sterilized, and secondly, it gives me much less trouble to have the nurse look after this than it does to keep several of these coats or aprons and have them constantly washed and sterilized at home.

The towels, like the sheets, are to be sublimated so as to render them aseptic, and then are dried. I am persuaded that we often add needlessly to the shock of an operation by chilling our patients with the towels wrung out of a hot sublimate solution. These quickly cool, and in at least one, if not two instances, I could trace severe attacks of rheumatism to the use of the wet towels. It will be noticed therefore that the sublimated towels which I use are all dry. The entire field of operation is surrounded by them, and the arm or leg (and sometimes both) next the field of operation is wrapped with these sublimated towels, well secured by safety pins. If the patient, then, in the ether-struggles happens to touch the part, it is by a disinfected towel rather than an infected arm or hand. Similarly in operations on the head or neck I pin one of these towels around the hair, and I also usually pin one around the inhaler.

(16) I have two pitchers of boiling water drawn on the morning of the operation and allowed to cool, so that I can dilute the hot water extemporaneously to any temperature desired with this cool, sterilized water.

(18) The wrapping-paper is for the purpose of making a hood for the Allis inhaler.

(19) The white flannel is for a binder, and in a breast case I always tear it lengthwise into two strips, each ten or twelve inches wide. One of these secures the dressing to the chest, and the other secures the arm of the operated side securely to the chest to obtain that essential, physical rest. I pin the two layers of flannel to each other behind the elbow in order to give support to the arm. A sling supports the forearm.

Part III.

(1 and 2) The sublimated gauze that I have found the most satisfactory is that made by Am Ende, of Hoboken, N. J. Any other make or Lister's double cyanide gauze may of course be ordered. I have lately used also with great satisfaction Hartmann's wood-wool dressing. I have had Dr. Coplin, the bacteriological assistant in the Jefferson Medical College Laboratory, examine this bacteriologically, and he has found it absolutely sterile. I rarely use sponges now, but more commonly cut up a half or a whole can of sublimate gauze into masses one-half to two-thirds the size of a fist and use them for sponges, throwing them away of course afterward. They may be used after Landerer's dry method, and even in cases where one does not wish to adopt this as a method I think the gauze mops are much less dangerous than sponges, no matter how carefully they are disinfected.

In the abdomen however I always use sponges, because in cutting the

gauze there are apt to be loose threads on the margin which I should be unwilling to leave in the abdomen. The wood-wool dressing I have not found so advantageous for sponging. It may be used, it is true, in little bags of cheese-cloth, but they are more troublesome to make than the simple cutting of the sublimated gauze.

I always use my dressings dry.

(3) The rubber dam is the thin rubber tissue generally used by dentists and known to dealers by this name. Even with sublimate gauze I always use it, not, as in carbolic acid dressings, on account of the volatility of the antiseptic, but to prevent the soaking through of the discharge at the points opposite the drainage-tubes. The size of the rubber dam is suited to each case.

(6) Outside of the rubber I ordinarily use a mass of "Globe antiseptic wool." I find it the best means of securing an equable and elastic pressure.

Part IV.

(1) The solution of carbolic acid is a little more than 1 : 10, and is made of this strength in order that it may be extemporaneously diluted with hot water for the instruments. These I place in one or more tin trays and cover them as soon as I arrive with the carbolic acid solution diluted to 1 : 20. Just before beginning the operation, after they have been soaking ten to twenty minutes, I pour off all this solution and cover them with boiling water. By this means they are thoroughly disinfected, and at the same time the substitution of the boiling-water prevents the destruction of the epidermis of my hands, which is one of the great objections to carbolic acid. The extra carbolic acid is to make more of the solution if desired, and as I always order the carbolic solution in a half-gallon bottle it can be made extemporaneously with sufficient accuracy. Scrubbing the hands with ordinary vinegar is the best means of removing blood, and neutralizes excellently any disagreeable effects of the carbolic acid. I owe this suggestion to Miss Dalziel, of the Orthopædic Hospital. In the Jefferson Hospital and elsewhere where I have a Schimmelbusch sterilizer I always use this instead of soaking the instruments in the carbolic solution, but in operations in private houses I find the carbolic acid more convenient and equally efficient. In the Jefferson Hospital we have also a Sattegast steam sterilizer for sheets, towels, gauze, etc., to be used instead of sublimating them. The Arnold sterilizer answers admirably also for this purpose and is much cheaper than the foreign makes. The largest size should be ordered. It is made of copper and costs $10. A croup attachment comes with it.

(5 and 6) While I frequently order morphine and opium suppositories lest they be needed the night following the operation, as a matter of fact

I very rarely have to use them. Antisepsis has almost abolished pain after operations, even the major ones.

(8) The alcohol is for the purpose of washing the hands and scrubbing the finger-nails after they have been cleansed with soap and water, and before cleansing them with the bichloride solution.

(9) I often give one or two ten-grain sulfonal powders the night before the operation, to overcome the natural apprehension a patient often feels and so secure a good night's sleep, and afterward, also, if necessary.

(14) The sublimate tablets are familiar now to the profession, and are by far the most convenient form of making extemporaneously the ordinary solution of 1 : 1000, or any other desired strength.

If the nurse understands her business as she ought, and follows the directions given, all the preparation will be made—the room and table all ready, the wrappers taken off the bottles, the corks sufficiently loosened, the lids of the cans of gauze loosened, and everything will be so arranged that the surgeon has only to prepare his instruments, needles, sutures, and gauze-sponges, and is ready to proceed without any loss of time to himself, his assistants, or his guests.

Instruments.

In order that I may not forget any instrument or appliance, even the most trifling, I have made out for my own use the appended manuscript list of instruments, etc. Before an operation I run over each item, first in the "general list" of instruments, etc.; secondly, the list of instruments for the especial kind of operation to be done, and lastly, the "special list" of instruments. This requires only a few minutes, and by it I am reminded always to see if any instrument or appliance has been omitted, and if the stock of such as are used up (silk, catgut, drainage-tubes, etc.) is exhausted, I am reminded to replenish it.

General List of Instruments, etc.

1. General operating-case.
2. Allis's inhaler.
3. Tongue-forceps.
4. Cocaine solution, 4 or 10 per cent.
5. Hemostatic forceps.
6. Retractors.
7. Sponges—ordinary size; elephant ear; small.
8. Sponge-holders.
9. Silk; catgut; iron and silver wire.
10. Drainage-tubes—rubber; glass.
11. Horsehair for drainage.
12. Sharp spoons.
13. Volsella.
14. Paquelin cautery.
15. Fountain syringe.
16. Large tin pans; small rubber pans.
17. Trocars
18. Long probes.
19. Long hemostatic (pedicle) forceps.
20. Photographic apparatus and shutter.
21. Electric battery and lights.
22. Forehead-mirror.
23. Rubber pad.
24. Aspirator.
25. Esmarch's bandage: tourniquet.
26. Iodoform-dredger.
27. Splints.

Instruments for Operation on the Brain and Spine.

1. Brain case of instruments.
2. Rongeur forceps.
3. Horsley's or other Rolandic fissure meter.
4. Broca's calipers.
5. Thermometer.
6. Müller's fluid.
7. Bottle for cerebro-spinal fluid.
8. Bottles for specimens.
9. Opium and ergot to be given beforehand.
10. Faradaic battery.
11. Keen's double brain-electrode.
12. Battery and electric light.
13. Iodoform-gauze.
14. Canula and hollow needle.
15. Decalcified bone.
16. Aniline pencil.
17. Rat-tooth forceps for dura.
18. Horsley's putty for hemorrhage from bone.
19. 1 : 2000 gauze.
20. Plain sterilized gauze.
21. Skull and Cast of brain.

Operations on the Mouth and Throat.

1. Special case of instruments.
2. Intubation-case.
3. Oral specula, gags, and retractors.
4. Stick sponges.
5. Special needles.
6. Volsella for tonsils.
7. Tonsillotome.
8. Long forceps.
9. Snare.
10. Tracheotomy tubes and tapes.
11. Feathers.
12. Long curved forceps.
13. Harelip pins.
14. Tracheal tube (Trendelenberg's or Hahn's).
15. Trachea dilator

Instruments for Abdominal Operations.

1. Count instruments and sponges before operating and again before closing abdomen.
2. Trocars.
3. Ovarian trocar and tubing.
4. Pedicle silk.
5. Senn's bone plates and Abbe's catgut rings.
6. Tube for washing stomach.
7. Long hemostatic (pedicle) forceps.
8. Abdominal retractors.
9. Kocherlé's serre-nœud and pins.
10. Enterorrhaphy needles and silk.
11. Elastic tubing.
12. Intestinal clamps.

Instruments for Operation on the Male Genito-urinary Organs.

1. Catheters.
2. Bougies and filiform bougies.
3. Sound.
4. Urethratomes and dilators.
5. Urethrameters.
6. Metal or rubber syringe, to inject air or fluid into bladder.
7. Lithotrites.
8. Litholaplaxy set.
9. Stone forceps and scoops.
10. Staffs (urethral and perineal).
11. Crooked scissors.
12. Watson's perineal drainage-tube and rubber tubing.
13. Long hemostatic (pedicle) forceps.
14. Snare.
15. Petticoated tube.
16. Modeller's clay.
17. Saucer.
18. Cocaine.
19. Keen's special retractor for suprapubic cystotomy.
20. Forceps and écraseur for tumors.
21. Petersen's bags.
22. Solution for bladder.
23. Cystoscope and battery.
24. Abdominal electric light.
25. Dalley's steel nail.
26. Catheter for ureter.
27. Arrange for Trendelenberg's position.
28. Ureteral catheters.
29. Perineum distender.

Instruments for Operation on the Female Genito-urinary Organs.

1. Special case of instruments.
2. Specula.
3. Stick sponges.
4. Special needles.
5. Perineum distender.
6. Long hemostatic (pedicle) forceps.
7. Hawk-bill or toothed scissors.
8. Snare.
9. Uterine sound,
10. Uterine clamp.
11. Uterine dilators.
12. Uterine curettes and forceps.
13. Strong rubber cord.
14. Trocars.
15. Long probe.
16. Crooked scissors.
17. Urethral dilators.
18. Petersen's bags.
19. Pedicle silk.
20. Abbe's catgut rings for lateral anastomosis.
21. Silk and needles for enterorrhaphy.
22. Koeberlé's serre-nœud and pins.

Operations on the Rectum.

1. Stick sponges.
2. Rectal specula.
3. Perineum distender.
4. Rectal bougies.
5. Forceps for piles.
6. Snare or écraseur.
7. Todd's rectal dilator.

Operations on Bones.

1. Case of bone instruments.
2. Esmarch's bandage.
3. Sharp spoons.
4. One-half inch trephine.
5. Surgical engine and drills.
6. Hand-drills and stout wire.
7. Special splints.
8. Suspension apparatus.
9. Plaster-of-Paris and plaster bandages.
10. Flannel.
11. Decalcified bone.
12. Sand-bag.
13. Adams's saw.
14. Macewen's osteotomes, chisel, and mallet.
15. Mastoid perforator.

Special Instruments.

1. Special case of instruments for each operation.
2. Iodoform in ether and syringe.
3. Rubber adhesive plaster.
4. Davies' lever or long skewer.
5. Bullet-forceps.
6. Nélaton's probe.
7. Tenotomes.
8. Plaster-of Paris bandages and plaster.
9. Morris's kidney-retractors.
10. Sand pillow for nephrorrhaphy or osteotomy.
11. Lithotomy forceps for nephrolithotomy and cholecystotomy.
12. Œsophageal bougies.
13. Bellocq's canula.
14. Mastoid perforator.
15. Special splints.
16. Instruments for gall-bladder and gall-stones.

I add a few words of explanation as before.

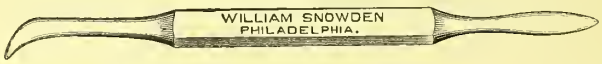
In my operating-satchel I always carry a small general operating-ease with the instruments ordinarily required. I need not enumerate them, for each surgeon will follow his own desires and the necessities of his kind of work. I may mention, however, a few which I have found especially useful.

I almost always use the Hagedorn needles, an assortment of which I carry in a small bottle in carbolized glycerin. For these I have found

by far the best needle-holder to be that of Abbe, of New York, with McBurney's spring catch on one blade of the handle. I have found the little "Tweed dropper" the most useful in etherization. It fits into any one of Squibb's ether cans, and thus avoids the necessity of carrying any ether bottle.

I have always found it an economy of space to have two of my scalpel handles tipped with Volkmann's sharp spoons. Another instrument I have, which is not generally known to the profession, is Dr. Allis's "dry

Fig. 2.



Allis's dry dissector. Half-size. The two blades are just thick enough to be strong.

dissector," for tearing tissues and separating muscles, loosening adhesions, scraping away the periosteum, etc. I find this one of the most useful instruments in my case. Instead of this I very often use two dissecting-forceps—one in each hand—one to seize and the other to tear the tissue, and have found them more useful by far than seizing the tissue with a pair of forceps and tearing with the grooved director or finger, though each of these means serves a good purpose at times.

I carry a few sponges in a glass-stoppered bottle in a carbolic solution, though I rarely use them now. In another bottle, in the same solution, I have some rubber drainage-tubes, silk, etc.; and in another smaller bottle, again in a carbolic solution, some disinfected horsehair for drainage. The horsehair is first washed well with soap and water, then with ether to dissolve the fatty matters, and then is disinfected in 1 : 1000 sublimate solution before being placed in the bottle. In addition to a nest of three large tin pans I carry a small rubber pan, such as photographers use, and place my needles, needle-holders, ligature-reel, and sutures in that.

Instruments for Operation on the Brain and Spine.

(11) My double brain electrode is figured in *Wood's Reference Handbook*, vol. viii. page 212, but the disinfected metal ends of the ordinary battery cords answer very well.

(18) Horsley's putty for hemorrhage from the diploë is made as follows: Melt repeatedly one part of yellow wax and four of vaseline. Next add carbolic acid, one part to twenty of the wax and vaseline, and mix intimately. Then add sufficient white wax to make a mass that will be hard when cold, but that can be quickly softened by the fingers. With this (kept disinfected, of course) he "putties up" the vessels in the edge of the bone.

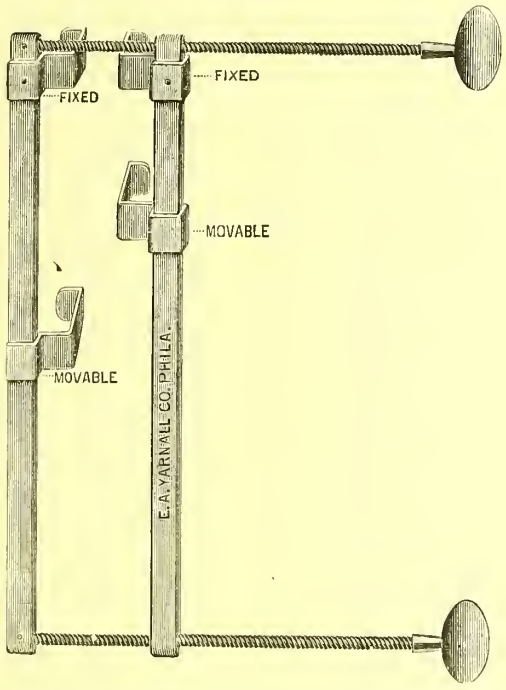
(19, 20) The 1 : 2000 gauze I always use to the head before head operations instead of the 1 : 1000, because I have found that the 1 : 1000 pustulates the scalp, which the weaker gauze does not do. Plain sterilized gauze I always provide for use as sponges as soon as the brain is exposed, as the antiseptic lessens or destroys the irritability of the brain to the Faradaic current.

(21) I always have a skull and a cast of the brain for reference during an operation.

Instruments for Operations on the Male Genito-urinary Organs.

(19) My special retractor (see illustration) I have recently devised and used with great satisfaction in one case. The very day I had it made I saw in the *Lancet* of October 18, 1890, p. 809, an instrument

Fig. 3.



The author's retractor for supra-pubic cystotomy, abdominal sections, etc., when needed.

of Dr. Watson, of Boston, for the same purpose. My own has, I think, the advantage that its force is better regulated than by a spring, and as two of the jaws are movable it may be used in the abdomen or elsewhere, and with varying sized openings.

Some instruments, etc., will be found duplicated in the lists, because I especially desire not to forget them.

Mr. Mayo Robson, of Leeds, has recently published a little volume of 52 pages, entitled *Instruments and Appliances Required in Operations* (London: Churchill, 1889). In this there is a list of instruments, dressings, appliances, etc., required in each operation. It will be found much more complete, of course, than my own. But I have found practically that a list covering the instruments required in each class of operations, together with the general list and the list of special instruments to be quite sufficient for my purpose.

My own method also has one essential advantage. In using Robson's book the surgeon has to write out all his directions each time for the nurse, for drugs, etc. By my blanks the surgeon tears one off from the pad and has only to check what he wants done in parts I and II., and hand it to the nurse, and check what he wants in parts III. and IV. and send it to the drug-store after adding his signature, the name and address of the patient, and the date. It is a great economy in time and trouble. He then looks over the lists of instruments, etc., and selects what he wants.